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VOL. XV

JANUARY, 1909

The Agricultural Student



A Monthly Magazine

DEVOTED TO AGRICULTURAL EDUCATION

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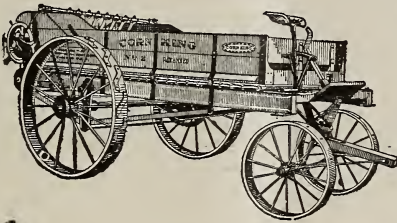
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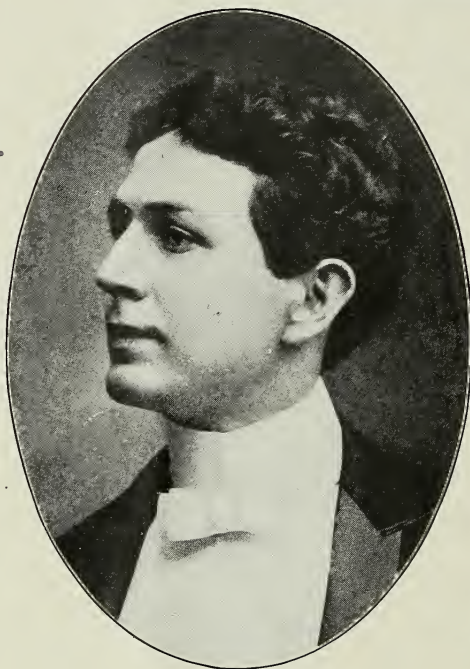
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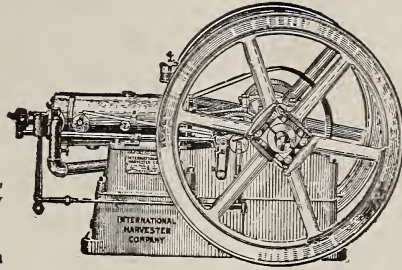
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CONTENTS.

January, 1909.

	PAGE
Cover Illustration—Photo by Watts.	
Frontispiece—	
American Cuckoo or Rain Crow, from drawing by R. J. Sim	6
Texas Agriculture—	
O. W. Reagin	7
Ohio State University at the International—	
Professor C. S. Plumb.....	9
The Students' Judging Contest—	
W. L. Elser, '09.....	12
Has Ohio Receded.....	13
It Has Not	14
A Stallion Law in Ohio—	
Professor F. R. Marshall.....	15
The Fixation of Nitrogen by Legumes—	
W. E. Hanger, '11.....	17
Hardy Catalpa—	
J. F. Zimmer, '09.....	20
Editorials	22
News Notes	23
Movable Agricultural School.....	25

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AMERICAN CUCKOO OR RAIN CROW

From drawing by R. J. Sim.

THE AGRICULTURAL STUDENT.

VOL. XV

OHIO STATE UNIVERSITY, COLUMBUS, JANUARY, 1909

No. 4

TEXAS AGRICULTURE

O. W. Reagin, '10

Agriculturally speaking, Texas may be said to be the greatest state in the Union. With 167,865,500 acres of land, 20,000,000 of which are in cultivation, and 74 per cent. of population engaged in agricultural pursuits, it can easily be seen that there must naturally be quite a number of different types of farming as adapted to the different soils and climate found in this large area.

In the northwestern part of the state is found the wheat growing districts, and, while this crop here is not grown on such an extensive scale as in Kansas and other parts of the United States, there is quite a crop, the annual amount being about 12,000,000 bushels.

Farther west and in the southwest is the stock raising district, characterized by some of the largest ranches in the world. These stock farms are chiefly cattle ranches, very little attention being paid to other stock. Texas ranks first in cattle shipping, as shown by the Chicago market reports, raising about 7,000,000 head annually. In the eastern and southeastern part of the state is the larger part of the 45,302,544 acres of timber land. In this part there is also quite a good deal of orcharding carried on, the latter having been developed only within the past few years, but now steadily advancing and coming to hold quite a

place as an orchard country. As yet, however, the railroad facilities are not so well developed as to give the best results in this type of farming. In the southern part of the state there are rice fields, with an annual production of about 10,000,000 bushels. Tropical fruits are also raised on a small scale in some parts of southern Texas. Over the state, however, it is the general type of farming which is carried on to the greatest extent. This kind of farming is to be found from the south-central, extending well up into the northern part of the state, and embraces the corn crop, which has an annual production of 150,000,000 bushels, and the cotton crop, with an acreage of 5,300,000 acres, producing about 2,000,000 bales. These are the crops of most importance, but still more on a general line comes the pork production, raising of horses and mules, and such crops as Irish potatoes, hay, etc., in connection with the corn and cotton. The writer is most familiar with what is known as the "black land belt," which comprises the north-central part of the state, and it is this section which he shall describe a little more as to detail.

The land is a heavy, black, tenacious soil, rich in humus and very productive for ordinary crops. It is retentive of moisture; hence, warming up slowly in the spring, requires quite a little time

to dry enough to be properly worked after rain, and is therefore poorly adapted for trucking. Corn, cotton and hay are the principal crops, and about the only source of income. Along with these crops, hogs, poultry, horses, mules and sheep are raised, but not generally to any great extent.

The preparation of ground for cotton and corn is about the same, the land being plowed in most all cases in the fall (some not because of the running together of the soil) with a large plow known as a middle burster, which has two wings turning the soil out on each side and throwing up a bank. This land, remaining this way over winter, is acted on by the frosts, and is generally in excellent physical condition by spring. In the spring seeds are sown right in these drills, they having become rather flattened on top during winter and therefore needing no dragging. The check rower is used very little, all cultivation being done lengthwise of fields. After planting, the crops are cultivated in about the same manner as in this country. Plowing is continued in the case of corn until it reaches almost mature size, when it is discontinued on account of tearing the corn down, and not at all on account of length of season, as this is long enough to permit of further plowing, and in the case of cotton until the bolls are mature and commence opening. In the fall, when the ears of the corn have become dried and firm, it is gathered by pulling the ears from the stalk, the latter being left in the field that it may return some fertility to the soil. Only the ears are utilized. The yield varies from fifteen to sixty bushels per acre, the average being about thirty bushels. The stalks in the field are cut into small pieces by

a revolving cutter, and the ground is again ready for plowing.

With cotton, the picking commences as soon as there is enough open to pay to pick. Large quantities are not allowed to remain open in fields, as a blowing rain, which at this time of the year is not at all infrequent, would result in a knocking out of the cotton and hence a loss to the farmer. As a general rule, picking commences about the first of September and continues until after Christmas, each field being picked four or five times. The price, or cost, of picking varies from 40 cents to \$1.25 per 100 pounds, according to the time of year, scarcity of hands and whether the cotton is relatively thick or thin in the field.

The cotton, being gathered, is hauled to gins in loads of about 1600 pounds. This is driven under a blower, which sucks the cotton in, and the seed and lint are separated, blowing the seed into a bin and the lint into a press, which makes the bale. The ginner has a twofold proposition for the farmer: He will gin the cotton for the seed and pay the farmer a premium of about \$3, or, if the farmer wishes to keep the seed, he will charge him about \$4 for ginning the bale. A bale of lint cotton weighs about 525 pounds. This is sold on the market, shipped to compresses, compressed, and from there to the cotton mills. The average production is from one-third to one-half bale to the acre, though a yield of one to one and one-half bales is often reached.

Hay production, while not important over large areas, is rather important locally. For instance, one small town bales and ships out annually about 5000 tons of prairie hay at the price of from \$5 to \$15 per ton, and in quite a few cases this is approached. The hay

is cut and baled in June and July. With good, clear weather, hay cut in the morning is baled in the afternoon. A press, as a general thing, does not run periodically, enough hay being cut to keep it running steady. Dews, which at this time of year are often heavy, are quite bothersome, as hay must be entirely dry to press, and to meet this difficulty large piles are dragged together and lined near the press during the afternoon. The next morning these piles are carefully skinned, so to speak; that is, the wet hay on the outside is removed with forks, and baling continues. In this way about forty tons can, with a steam self feeding press, be baled in a day.

Now, as to the sheep, poultry, hog raising, etc., this is done mostly to provide the farm, little stock being sold, and, if any at all, it is locally and does not figure, generally speaking, in the income of this section, though there are several stock farms.

The land now, broadly speaking, seems to be getting less fertile, due to a constant drain on the fertility by continuous cropping, and only in a few cases are men pretending at all to return any of the fertility. Some land has been cropped in cotton for ten years without anything at all in the way of fertilizer being added to the land. The idea of crop rotation, though as yet only in a small degree, is being taken up. For instance, corn and cotton lands are interchanged. While this is the simplest rotation, being only a course one, it has the right idea and in itself will doubtless help to some extent. That manuring and fertilizing, though, will soon come into favor and be practiced rather generally in this section is almost certain; and when this is done and another crop added to rotation, leguminous, if possible, this land will be as productive as ever and will put the best lands of the country to a test.



GROWING AN APPETITE

OHIO STATE UNIVERSITY AT THE INTERNATIONAL*Prof. C. S. Plumb*

The 1908 International Live Stock Exposition was in various respects the most notable one in the history of that institution. The exhibition of cattle was not only large, but of surpassing excellence. The steer show had less inferior individuals than ever before. Undoubtedly it was the finest fat cattle exhibit in the history of an American show ring.

The Ohio State University exhibited fourteen steers, including six Shorthorns, four Aberdeen Angus, one Galloway and three grades or cross-breds. The shows in the various classes were large, and it was an honor to get in the prize list, which usually included five places. We made our best showing with the Shorthorns, winning fourth place with Ohio's Stamp, a two-year-old, second place in junior yearling specials with Ohio Pedro, and eighth in senior calf on Ohio's Gift, and fourth with junior calf in Shorthorn specials with Ohio Boy.

Our Aberdeen Angus steers were entirely outside the prize list, as were many really fine animals. The Galloway yearling, Scottish Lad, was fourth in class. Ohio's Roan Texan, a two-year-old steer in grades and cross-breds, won fifth in special. Our grade Hereford yearling won third in special, while Ohio's Pet, our cross-bred spayed heifer calf, was fourth in a very large ring.

The University exhibited eighteen hogs, representing pure bred Berkshire, Large Yorkshire, Poland China and cross-bred barrows. We did not do so well with Berkshires as we should have. Only colleges were in the Berkshire competition, with herds from Ohio, Wisconsin, Indiana and Iowa. In this breed contest we secured second prize on pen of three barrows, twelve to eighteen months old, and third on one barrow

over twelve months and under eighteen, and third on pen of three under six months. Iowa won the breed championship with Wisconsin second. In the Large Yorkshire show, Ohio won second in class of pigs under six months old, and first and second prizes on pens of three under six months and the breed championship on pen. Our Yorkshire exhibit was regarded as of very superior merit.

Ohio State also did well in the cross-bred and grade class. We had the first prize pen of three of 200 to 250 pounds class, and second prize on pen in the 150 to 200 pounds class. We also won third prize in the Clay-Robinson specials on college exhibit, and in the carcass contest had the third prize in weight of 100 to 150 pounds.

The University showed a Clydesdale filly two years old and a Clydesdale horse foal, neither of which came within the prize list. The competition here was large, and our exhibit did not find the necessary favor with the judges to secure a place.

From the exhibition point of view it may be fairly stated that the University sent the best showing of stock it has made in the four consecutive years it has contributed to the International. Of this there is no doubt. The more severe competition, however, simply required very outstanding animals to win. We have no reason to be ashamed of what we exhibited, but another year we must have still better animals if we wish to reach the high place in the line.

After the show seven of our steers were sold in the auction sale at the International, and at very satisfactory prices. Clay, Robinson & Co. had charge of the University consignment and the prices

realized ranged from $8\frac{1}{4}$ cents a pound for the Shorthorn steer, Ohio Signet, up to $10\frac{3}{4}$ cents for Cow Boy, the two-year Aberdeen Angus. Excepting the grand champion steer of Purdue University, the Ohio steers brought better prices than those consigned by other colleges, which was a cause of considerable satisfaction to Ohio State people. Our show barrows also sold at a good price, realizing from 6 to $6\frac{1}{4}$ cents per pound for the live hogs, and up to 8 cents for the carcasses in the carcass contest.

The student judging contest at the International and at the National Dairy Show, gave Ohio State a creditable, though not premier position. In the International contest, with eight colleges competing, we had second place in horse judging, third with cattle and sixth each with sheep and swine. The Ohio International students judging team consisted of Henry Dilatush, S. S. Hart, J. M. Munger, C. E. Snyder and W. L. Elser.

At the National Dairy Show a contest in judging dairy cattle was held on December 3 by three representatives each from nine different colleges. The comparative rank of only the first three teams was given, these being Iowa, Nebraska and Minnesota. Yet Ohio State must have had close to fourth position in the

contest. The Ohio team was second in judging Guernsey's, third with Jerseys, while Moore was first and high man in the Guernsey judging, making 200 points and a perfect score on placings and reasons. The Ohio team consisted of Messrs M. D. Moore, John Hervey and G. C. Long.

The Ohio State University returned from Chicago, not with the highest honors, but with a creditable record. It is not reasonable to expect to always win first prizes and championships. Ohio has in the past secured a fair share of the high awards of the International. No doubt she will do so again in the future. The important thing is to breed and feed the best of stock first for class room instruction and secondly for exhibition. Then in 1909, if conditions justify, in due season we will make our contribution to the greatest show of fat stock in America.

A true stockman is a good loser as well as a good winner in the show ring, a lesson that every animal husbandry student with the exhibitor's ambition should learn. Perhaps Ohio State may lose again, but it will be with good grace, and with a determination to return to the ring again stronger than ever.



A WIND-BREAK OF NORWAY SPRUCE

THE STUDENTS' JUDGING CONTEST

W. L. Elser, '09

The ninth annual International Live Stock Exposition was held in Chicago, beginning November 28, that being the date of the students' judging contest. On this day the students of the various agricultural colleges held full sway. In all, eight institutions were represented and as usual much interest was manifested in the competition, and the work proceeded under favorable conditions.

Shortly after 8 o'clock on Saturday morning, Prof. J. H. Shepperd, of the North Dakota Agricultural College, who was superintending the contest, called the contestants together. He then explained how the work would proceed and then assigned each contestant a number. He then divided the contestants into four groups so that not more than two men from the same college should be in one group.

Four animals each of cattle, sheep, swine and horses were then brought into the big arena, and each group of contestants was assigned to a particular class of animals. After the allotted time had expired, each group of contestants passed on to the next group of animals, and so on, until each group had placed all the different classes.

Then each contestant went singly before a committee, which had previously placed the animals, and gave his reasons. Fifty per cent. was allowed as a perfect grade on placings, and fifty on reasons.

In each of the cattle, sheep and swine classes, fifteen minutes was allowed for the looking over and placing of the animals, and two minutes allowed to give reasons in. In the horse classes twenty minutes was allowed for placing.

In the cattle and sheep classes there were two rings of breeding stock and

one of fat stock in each class. The first ring of cattle judged was Hereford bulls. The next was Shorthorn heifers under six months, to be judged as breeding stock. The next was the fat class, consisting of two Angus, one Hereford and one Shorthorn.

The first class of sheep was a sweepstakes class consisting of two yearling and two lambs of the Cotswold breed to be judged as breeding ewes. The next class was a class of Shropshire ram lambs, and the next was the fat class consisting of two Southdowns, one Cheviot and one Shropshire. They were to be judged as fat sheep, disregarding sex, age or breed.

The rings of hogs consisted of four Chester Whites to be judged as grade market hogs, and a ring each of Duroc Jerseys and Poland Chinas, to be judged as market hogs, taking breed characteristics into consideration.

The first ring of horses consisted of four very poor geldings which the contestants were instructed to judge as carriage horses. The next was a sweepstakes class of Percherons, consisting of one four-year-old, two three-year-olds, and one two-year-old. The last ring was a class of Belgians.

The final score and standing of the various colleges is given below:

TOTAL SCORE.

Iowa	4373
Nebraska	4153
Texas	4081
Missouri	4076
Kansas	4075
Ohio	4036
Ontario	3943
Minnesota	3859

HORSES.

Iowa	1186
Ohio	1075
Minnesota	1073
Kansas	1067
Nebraska	1064
Missouri	1064
Texas	1050
Ontario	1023

CATTLE.

Iowa	1296
Kansas	1265
Ohio	1227
Nebraska	1206
Missouri	1199
Texas	1189
Ontario	1128
Minnesota	1020

SHEEP.

Texas	1090
Ontario	1077
Iowa	1049
Missouri	1016
Nebraska	1016
Ohio	959

Kansas	945
Minnesota	888

HOGS.

Nebraska	873
Minnesota	856
Iowa	842
Kansas	798
Missouri	797
Ohio	775
Texas	746
Ontario	715

The team representing Ohio State University was composed of W. H. Dilatush, C. E. Snyder, W. L. Elser, J. H. Munger and Stanley Hart. C. E. Snyder was the high man of the team and Stanley Hart was tied for third place among all the contestants on horse, and W. L. Elser was fourth on cattle.

Prof. Marshall has won for himself the admiration and respect of every man on the team for the way in which he conducted the work and for the "white" manner in which he treated the men.

HAS OHIO RECEDED?

While turning over the treasures of a second-hand book store one recent rainy day, I came upon a small book, yet neat in its coat of leather, and still proud of its badge, "Ohio School Library." Its title page read, "The Elements of Agriculture, Geo. E. Waring, Jr., D. Appleton & Co., New York, MDCCCLIV."

The book brought to my mind the days of the sub-district school and its library. A letter to the State Commissioner of School concerning a history of the school library gained us but little knowledge of a general nature and a reference to an article published in Ohio libraries in 1897. The school library has been forgotten. I purchased the old volume for sake of its memories and the good it had done in its younger days. As I re-read

its pages the question, "Has Ohio Receded?" came to me.

Fifty-four years is a long time. When we compare this book and its companions with those of today, and consider the vast strides made in other directions, is not the question a pertinent one, and its answer must be with the affirmative.

Since 1854 we have expended millions of dollars on agricultural education. It is true we have accomplished a great work, but are not the principles of science about the same as taught in the books of our forgotten school library? What has taken its place? Nothing.

We issue a flood of "bulletins," beautiful charts and elegant monographs. What has become of them? Many go to friends of the author, a few go to city

libraries to be stored in the basement, and the balance are sold at cost of publication, or so sold to make room for new publications. Why not use them to form a nucleus of a new and permanent school library system. Stock it with our agricultural publications which now find their way to the waste basket and furnace.

Who is and who will continue to be the actual farmers? It is not the city resident or the educated country boy. The farmers class will continue to be made up largely of the tenant class. It is this class who needs the library system of educational training. Aid them. In many cases it is their only opportunity.

Exercise judgment in the preparation of the publications. Condense the printing, use more illustrations, apply rigorously the blue pencil to the monograph writer who is making his reputation at government expense.

Improve the district school, equip it with a stereopticon and a phonograph. Give moving pictures entertainments of farm scenes and processes. Phonographic records of lectures by agricultural authorities will be an invocation. Get the people together. Give the barefooted, freckled faced country boy a chance. If rightly treated, he and his sister will stay on the farm.

CHAS. P. FOX, O. S. U., '90.

IT HAS NOT

I have read Mr. Fox's letter and find many points of interest in it.

"The Elements of Agriculture," referred to in his letter, is to be found in many of the old school libraries. These books, like the school libraries of the early fifties, were good but both were in a degree ahead of their time. Many of the modern agricultural texts contain discussions which are, in the main, the same as this splendid old text, but the fact that our soil has lost its virgin fertility makes the need for the present day text much greater than "The Elements of Agriculture" of 1854. In addition to that, the general education of the people is such that the book of 1854 could be much better read today than at that time. I do not think there is any retrogradation but a marked progression, as has been in-

dicated during the past ten years. Necessity has not only been the mother of invention—an application usually made to material things, but also the mother of interpretative power, which the new education of today is giving us.

New occasions teach new duties;

Time makes ancient good uncouth.

They must upward still and onward

Who would keep abreast of truth.

Lo, before us gleam our camp fires,

We, ourselves, must pilgrims be:

Launch our Mayflower, and steer boldly

Into the desperate winter sea.

Nor attempt the future's portals

With the past's blood-rusted key.

—Lowell.

A. B. GRAHAM.

A STALLION LAW IN OHIO?

Prof. F. R. Marshall

The new spirit of education in agriculture is manifesting itself in various ways. The agricultural college and the farmers' institute, central forces in this great work, act as clearing houses for ideas and information on agricultural topics. The work begun by these institutions promotes a spirit of inquiry and desire for improvement, which, working through the laity of the profession, are frequently evidenced in legislation that a few years ago would have been impossible. As the farmer becomes more of a business man the greater becomes his necessity of dealing with outside interests and parties from whom he can procure the means of improving the yield and quality of his marketable products. To ensure safety and protection in cases where individuals would be helpless, the purchasing agricultural public has had enacted laws such as those requiring the inspection of nursery stock offered for sale, and the tagging of feeds and fertilizers to show the manufacturer's claim as to the value of the contents of the package.

The average horse breeder raises but two or three colts each season. To secure the services of a stallion it is imperative that he join hands with a number of his neighbors in becoming the owner of a good animal, or that he hire the services of a horse owned in the section. Such commodities as are necessarily the subject of barter may fairly be controlled by such statutes as the state sees fit to enact in the interests of its citizenship.

During the past four years five states have put into operation laws designated to ensure that stallion owners properly represent the breeding of their horses and to improve the average excellence of

those horses standing for public service. While Ohio is commonly stated to be delinquent in this matter, it is a fact that in 1898 a serious attempt was made to secure the passage of a law that would operate to effect an improvement in the class of stallions used in this state. That law was defeated by considerations that do not now exist.

The general plan of those laws referred to, and which are doing a conspicuous service in Wisconsin, Minnesota and Pennsylvania, is as follows: For every stallion for which money is collected for service of mares owned by other persons, the owner must secure a state license. Copies of the license issued must be used in every form of advertisement for the horse and must be posted in every stable in which the horse is kept during the breeding season. This license is drafted by the official entrusted with the enforcement of the law, to show the actual breeding of the horse, whether pure bred or grade, and if pure bred, by what record association registered. Licenses are refused to horses found to possess any of certain enumerated unsoundnesses believed to be hereditary. The Wisconsin law names the following forms of unsoundness that may register a horse ineligible for a license: Cataract, moon blindness, roaring, heaves, string-halt, bone spavin, ringbone, sidebone, navicular disease, bog spavin, curb with curby formation of hock, and glanders.

Considerable horsemanship and discretion must be exercised in the enforcement of such a law to ensure justice to meritorious stallions that are known to sire good colts and which might be excluded from service through a technicality.



A STALLION STANDING IN OHIO

The chief value of a stallion law lies in the opportunity to acquaint the mare owners with the facts regarding the stallions of their vicinity and to arouse an interest and inquiry that will procure proper recognition and appreciation for the superior horse and discourage the patronage of the low grade animals whose progeny fill no market class and exhibit no uniformity except in commercial inferiority. There is no disposition to dictate or suggest what kind of a horse any farmer or community should patronize. The object is to destroy the business of the inferior sires. These inferior sires are found mainly, though not altogether, in the ranks of the grades. The popular stallion law is simply another engagement in the campaign for the annihilation of the scrub.

The main thing to be said in favor of issuing a license to a grade stallion is that it renders possible the securing of a reliable stallion census with full details

as to the ownership and ancestry of every stallion. A full presentation of the facts is sure to result in steps for better conditions.

At the end of the first year of administration of the Wisconsin stallion law it was found that there were standing for service in that state, 1067 pure bred horses and 1561 grades. During the two succeeding years the number of grades decreased thirty per cent.

It might be expected that an Ohio census would show a majority of pure bred stallions, but until some step is taken to disclose the actual figures and arouse public interest in the question no united stand for improvement can be expected.

Ohio was the birthplace of draft horse breeding in America and any steps to demonstrate and ensure her title to first position in the quality of her horses should receive unanimous and energetic support.

THE FIXATION OF NITROGEN BY LEGUMES

W. E. Hanger, '11

A number of theories have been advanced concerning the vital factors that pertain to soil fertility. Some have claimed that productivity of soil depends solely upon the amount of moisture or rainfall; others that fertility of soil can not be maintained without thorough cultivation and have gone so far as to say that "tillage is manure."

While both of these theories are partially correct, we find when we study the subject closely that there are still other factors which have fully as much to do with the productiveness of soil as either a large amount of water or excessive tillage.

The analysis of plants reveals to the chemist that from one and one-half to three per cent of the dry matter of plants consists of nitrogen.

While^V this is quite a small amount in comparison with some other elements contained in plants, it is very essential and in fact the most important of all plant foods from the practical point of view. In fact the solution of the problem of maintenance of soil fertility depends upon an economical method of conserving and renewing the nitrogen supply of the soil. This does not mean that nitrogen is more essential than some other elements, but it is most easily lost and the most expensive to replace by means of commercial fertilizers.

The^C loss of fertility in the soil of worn out farms is due doubtless to a number of factors, but the loss of nitrogen is certainly the most prominent one. I have said that nitrogen is the element which is most easily lost from the soil.

Let us consider for a moment the various ways in which the soil loses its nitrogen.

a. Bodies of animals and plants after death are carried by running water into streams by which eventually they reach the sea.

b. A great deal of nitrogen is taken off the land as human food and taken to cities where it finds its way through the sewage into streams and it also in time reaches the sea.

c. Denitrification is also a factor in setting nitrogen free from the soil.

d. Quite a little nitrogen is carried away by underground drains.

Since the loss of nitrogen is constantly taking place and because it has so much to do with the fertility of the soil it is well to note some of the ways in which it is being replaced or restored to the soil.

1^K. The immediate source of humic nitrogen is the slow decay of organic matter, whether this be the roots, stems or leaves of plants, or the tissues and waste products of animals.

2^C. It is abundantly demonstrated that nitrogen is being added to the soil by the growth of micro-organisms in the soil.

3^C. The formation of nitrous and nitric acids through the oxidation of the nitrogen of the air by electrical discharges such as occur during thunder storms is generally conceded, but the amount of nitrogen added in this way is too small to be of great importance to plant life.

4^C. There is another means of increasing the supply of nitrogen of more practical value to the farmer and depends upon a peculiar relation existing between bacteria and the family of leguminous plants.

Key to references:

- K.—King
- C.—Conn
- V.—Vivian
- S.—Storer

It was proved by a great number of experiments that ordinary plants cannot fix free atmospheric nitrogen, but in 1881 it was shown that peas were an exception to this rule, and the assertion was made that peas can assimilate atmospheric nitrogen.

The question at once arose as to the conditions under which fixation of atmospheric nitrogen occurs and this was rightly considered to be of utmost importance.

In the next ten years due to a great deal of scientific research it was demonstrated that the fixation of nitrogen by the legume is dependent upon the growth of certain soil bacteria.

The^C first step in this discovery was the observation that the fixation of atmospheric nitrogen by legumes is associated with the development of nodules or tubercles upon the roots. These nodules had been noticed for a long time but were thought to be due to a diseased condition of the plant, although they seemed to have no bad effect on the growth of the plant.

Now^C when it became known that the legume could fix nitrogen a number of experiments followed and proved that only those plants that developed tubercles added any nitrogen to the soil, hence it became evident that the power to fix nitrogen was associated with the tubercles. A close examination of the tubercles revealed the presence of micro-organisms or bacteria. That the tubercles revealed the presence of micro-organisms or bacteria. That the tubercles were developed by the presence of these bacteria was proven by dipping the tip of a needle into cultures of the micro-organisms and pricking the rootlets of young legumes at various points, when it would invariably follow that tubercles would develop at the point where the slight wounds were made.

In^{K. S.} 1888 Hellriegel published the results of his studies, which thoroughly established the fact that great numbers of microscopic forms of life inhabit the roots of leguminous plants forming upon them tubercles in which the organisms live and withdraw free nitrogen from the soil and air for their needs. It had long been known to farmers that in some way clover in rotation with other crops, left the soil richer in nitrogen and it is now known that the bacteria which live in the clover roots, deriving a part of their food from the clover plant, at the same time increase the nitrogen supply available to the clover crop and so we have two forms of life living together in what has been termed symbiotic relations.

There^C is no doubt that these bacteria from the soil make their entrance into the roots in the young condition of the legume, passing into its roots through the delicate root hairs. Inside they find favorable conditions and multiply rapidly. Their presence serves as a stimulus to the root tissue of the plant which results in an abnormal growth of the root. The cells of the root tissues multiply more rapidly and more abundantly than usual and the extra growth produces enlargements known as tubercles. The tubercle is thus really a growth of the root itself, which has been stimulated by the presence of the bacteria.

It becomes a very difficult problem to know the relation of the nodule forming process to the assimilation of free nitrogen. There is no doubt that this takes place, but whether it is taken in through the leaves or through the roots is not so easily settled. It has been recently asserted that the nitrogen does not come directly from the air, but from the nitrogen dissolved in the soil water and absorbed through the root hairs. The fixation of nitrogen is the combined result of the organisms acting together. Ex-

actly how this occurs is wholly unexplained, but the phenomenon of association for mutual benefit is known by biologists as symbiosis.

It^C is impossible at the present time to determine positively just how this is done, but this much is certain that the legume and the bacteria together are able to fix atmospheric nitrogen in quite large amounts. Neither the legume or the bacteria can do this alone under ordinary conditions.

The power of fixing atmospheric nitrogen is dependent to a considerable degree upon the amount of nitrogenous food already in the soil. The legumes prefer taking nitrogen from the soil when they can obtain it from this source, so that if a soil is rich in available nitrogen the growth of legumes will add no nitrogen to it.

One matter that has puzzled the far-

mers is the familiar fact that the same kinds of legumes can seldom be grown continuously on the same piece of land for any great length of time, no matter how fertile the land or how abundantly it may be supplied with plant food. As a general rule the roots of such plants if closely examined will be found to be covered with nematode worms, which, of course, take vigor out of the plant.

The too frequent growing of legumes, says Liebscher, far from breeding the nitrogen bringing bacteria, may perhaps do the land harm by filling it with pernicious nematodes.

We may conclude then, by saying that the growth of legumes is the most practical way of increasing the available supply of nitrogen in the soil, but it may be overdone by attempting to grow legumes for too long a period on the same piece of land.



MUCH WINTER PLOWING IS NOW DONE IN OHIO

HARDY CATALPA*James F. Zimmer, '09*

History tells us that forest planting on the prairies west of the Mississippi began with the earliest settlers. Trees were planted for several reasons by these people. The protection from the sun and wind, also for the need of timber and posts were the principal reasons for tree planting. In about ten years after these settlers took up habitation on these prairies, extensive groves marked almost every farm. The great success of these groves showed the people that planted trees could take the place of the natural forest. The trees were also planted for fuel, as the price of fuel was extremely high, so far from the natural forests. The idea of growing posts and poles to sell did not appeal to their minds until many years later. It was too long an investment for these settlers in their new country, they had to attend more to the present day and let the future provide for itself.

Not until about 1880 did the planting of trees, to be used for posts, poles, timber and railroad ties, appeal to the minds of the people of this country; and at this time many plantations were started. The marked success accomplished in these plantations has encouraged many to plant for the same purpose, and as a result of the work there are now in the Middle West quite a large number of commercial plantations, in some of which the marketing of products has already begun.

Now, as to the tree planted for these commercial purposes, in the region of Southern Iowa, Nebraska and Eastern Kansas no tree is more extensively used than the Hardy Catalpa. Its native habitat was along the Lower Wabash and Ohio rivers, and here it

gained the reputation for rapid growth and durability. By experiment it was shown that it did remarkably well on the plains, because it was propagated easily, grew rapidly on prairie soil, had a very good form and could stand drought very satisfactorily; also that it had no serious insect or fungus enemies. The greatest quality of this tree which caused it to be so generally recognized was the lasting power of the timber which was adapted for so many uses. As a post timber it has given excellent satisfaction and ranks with the black locust and osage orange in durability, but goes far ahead of them when it comes to rate of growth, form, and to freedom from checking.

The only fault to be found with the catalpa for poles is its tendency toward crookedness, but perhaps in time a method of pruning can be found to overcome this. Regarding this tree as a factor in the production of railroad ties, it has not had sufficient trial so that it can be definitely stated what its rank should be.

The main commercial plantations of catalpa are in Iowa, Kansas, and Nebraska, Kansas leading in having the greatest number of large and successful plantations. The four oldest and largest plantations of that state are Munger, Farlington, Hunnewell, and Yaggy plantations.

The Tree.

This tree (catalpa) belongs to the family Bignoniaceae, Catalpa family. This family is made up of about five hundred species, mostly represented in the tropics, and all of them are woody plants.

There are only two species found in Ohio, viz.: (a) *Catalpa Catalpa*; (b) *Catalpa speciosa*.

Of these two varieties the *C. speciosa* is the more important from the economic point of view because it is the variety that produces the best timber for post and poles; as the other species heads exceedingly low and the trunk or bowl grows very crooked. This is one way of distinguishing the two sorts, and also the *C. speciosa* has much longer pods, and they hang more in clusters.

The popularity of the *C. speciosa* has been considerably injured through carelessness in sending out seeds and plants of the southern catalpa instead of the hardy species.

The *C. speciosa* attains the height of about thirty to forty feet, and usually has a fairly erect trunk. The tree is started from (pod) seed, each pod gets to be about fifteen to twenty inches in length and contains hundreds of seeds. These pods break at the lower end at maturity and the seeds scatter out a few at a time and in this way have a better chance to disseminate. Each seed has a long flat covering or coat and may be carried some distance by the wind.

The flowers of this tree are exceedingly beautiful and fragrant. They are formed in great clusters, sometimes ten or fifteen flowers on a small branch or stalk. They are white in color, some containing tints of lavender and orange or yellow. They make a splendid place for the bees to gather honey, and these little workers take advantage of the opportunity during its flowering season.

The leaves get to be very large in some cases, measuring about ten inches across and from the attachment of petiole to apex about fifteen inches. The leaf has a very broad base, margin is entire and the leaf is netted veined. The bark is more or less smooth and scales off somewhat.

Points on Plantations.

1. It has been shown that the catalpa attains its best growth on very rich soil. In one case the returns on the best soil were almost five times as great as on the poorest soil. One plantation showed an annual profit from the rich loam soil of \$21.55 per acre.

2. If grown alone or mixed with trees no taller than itself and especially in plantations on the plains, the catalpa should be protected from prevailing winds by shelter belts of taller trees.

3. It is much cheaper for the planter to grow his trees from seed than to buy them from a nursery.

4. The plantations should be planted so the trees are about four feet apart, giving each tree a space of sixteen square feet. The close planting kills the lateral branches while young.

5. The cutting back of the young trees after two or three seasons' growth, and the training up of a single sprout, prevents side branching.

6. Thinning is necessary in about eight or ten years, but these trunks taken out are usually large enough for posts.

7. The heart-wood forms nearly three-fourths of the volume of the tree and is very durable if properly seasoned.

Fungus Diseases.

Soft Rot: The mycelium of this fungus destroys the heartwood very rapidly after it has gained entrance into the tree.

Brown Rot: This acts something like soft rot.

Blight Disease: This fungus affects the leaves and buds, causing them to shrivel, turn black and fall off. This disease is spread by one of the gall gnats.

THE AGRICULTURAL STUDENT

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JANUARY

EDITORIALS

The Movable Agricultural School

We are glad to see such good results in the first attempt at a farmers' short course school carried directly to the farmer.

Being "on the ground," excellent instruction can be given which will apply directly to the soil conditions and live stock of a given community. Being brought directly to the farmer, he looks upon such instruction in a new light. He finds that these agricultural professors are not all "book men." On the contrary, he finds them very practical and able to show him a lot of things about his business.

If not very evident now, it will be in a few years that Mr. Allen, the banker who started this school, simply made a good business move. We are sure that all the farmers of Paulding county wish him lots of business.

The Judging Team

"What was the matter with the judging team this year?" is a question that all who are interested have asked when-

ever they have the opportunity. The editor, having been a member of this team, is not going to offer any excuses. We simply ask that you will look not so much to the ranking of the team as the number of points that separated the teams. From Texas to Ohio we do not think there was a difference of enough points to show any difference in the ability of the teams. Such a great amount of work being put on this phase of animal husbandry work in western schools means that we must increase the time we put upon the same work if in the future we are to be counted high in the final rating. A good judge of live stock is only made by experience, and it takes a good deal of that.

Stallion Law in Ohio

Please notice the article "A Stallion Law in Ohio?" by Prof. Marshall. It will be found on another page of this issue. If you haven't been thinking much about the horses in Ohio lately, this will help you to keep in mind that many stallions are used for service in Ohio that would make poor work horses. Many are unsound and have hereditary weaknesses or diseases that will be transmitted to their colts. For instance, think of breeding to a stallion such as that, the cut of which appears in this issue. You say that you wouldn't breed to him. Of course not. Lots of men do, though. It is a matter of educating the farmers. We cannot blame the stallion owners for standing inferior horses for service as long as men use them. The people become educated in less time though when they are stirred up occasionally and forced somewhat by laws if necessary. We must push them along a little in Ohio by means of some sort of a stallion law.

NEWS NOTES

The annual meeting of the Ohio State Dairy Association will be held February 3, 4 and 5, at Townshend Hall, Columbus, Ohio. Among the prominent speakers are Ivan C. Wells, of Washington, D. C., Dr. Billings, of the Department of Agriculture, and Col. Lilia, of Michigan. The Association at present time has a larger membership than ever before and is increasing rapidly. Judging from interest taken by dairymen of Ohio, the coming meeting will prove to be one of the largest the Association has ever had. The Association will hold a branch meeting at Delta, Ohio, on January 6 and 7. This latter meeting is due largely to Timothy Mojomnier, a former student of this University, who is a manager of a large milk condensing plant in that locality.

The applications for admission to short course in dairying are rapidly coming in. The number at this date prior to time of registration is larger than any previous year.

At the last International the Animal Husbandry Department of Iowa State College made the greatest record in its live stock exhibit in the history of the show. All the animals exhibited had been used almost daily since September 1, for the instructional purposes in the judging pavilions. At the Shire sale at the time of the show they purchased at public auction three Shires at a cost of \$5000.

It is certain that some sort of a stallion law will be introduced at the coming legislature.

W. L. Clevenger, '06, visited Sunbury, inspecting the creamery at that place.

"Joe" Gourley, '08, was at the University the week of December 19. He went to Baltimore the week after Christmas to attend the meeting of the American Association for the Advancement of Science.

N. E. Shaw, '06, State Nursey and Orchard Inspector, went to Baltimore the week after Christmas to attend the meeting of the American Association for the Advancement of Science.

I. S. Cook, '06, of Chillicothe, acted as one of the official judges at the Omaha corn show.

The American Association for the Advancement of Science at Baltimore, Md., during the holidays was pretty well represented by Ohio State. Mr. Vernon L. Wildermuth, Lenard L. Scott and James F. Zimmer were the only students present at this meeting from the "Ag" College. The meeting was a very profitable one and many of the leading "Ag" professors of the United States presented papers at the Association.

The "Ag" College has sold the Short-horn bull, Ohio Czar, to David O'Brien, Glenville, W. Va.

The College received two fine gifts at the International in two Cheviot wethers; one was given by Boyd & King, of Hillsboro, Ohio, and the other by G. W. Parnell, of Wingate, Indiana.

The judging pavilion is now decorated with a beautiful flag, the gift of the Sophomore Class in Animal Husbandry.

A Four-Year Course in Forestry

At the last meeting of the University Faculty a four-year course in Forestry was adopted.

This is a technical course leading to a degree and fitting the student for a profession. The entrance requirements are the same as for the course in Agriculture, except that solid geometry is required.

A large part of the first two years of the course is devoted to those sciences and arts that are fundamental, or preliminary, and form a natural basis for forestry proper, to which the last two years of the course are mainly devoted.

A certain amount of forestry, together with dendrology, surveying, and topographical drawing is given in the first two years, so that the student is at once introduced to the real subject of the course.

The course is well balanced and is exceptionally well planned. While it goes into full operation the beginning of next year, students who desire to enter in advance of the Freshman year, can take some of the courses the present year.

The establishment of this new course naturally incites interest in a new building for the Department of Forestry and Horticulture, and this is now regarded as one of the most imperative needs of our college.

MODERN SHEEP—By "Shepherd Boy."

Published by the American Sheep Breeder Company, of Chicago.

This book of 333 pages covers the sheep question in such a practical manner, from the history of breeds to the diseases of sheep, that no sheepman can afford to be without it. It contains over 100 excellent photographs. Get it. You'll not regret it.

Special Lecturers in Ten-Weeks Course in Agriculture

At 4 o'clock each day a special lecture will be given on some subject of vital importance to agriculture. The following men have been secured to deliver from one to five lectures each:

Charles E. Thorne, Wooster, Ohio, Director of the Ohio Agricultural Experiment Station.

Joseph E. Wing, Mechanicsburg, Ohio, Associate Editor of the Breeder's Gazette.

C. G. Williams, Wooster, Ohio, Agriculturist of the Ohio Agricultural Experiment Station.

H. M. Brown, Hillsboro, Ohio, President of the Ohio State Board of Agriculture.

E. R. Root, Medina, Ohio, Editor of Gleanings in Bee Culture.

C. W. Burkett, New York, N. Y., Editor of the American Agriculturist.

Chas. McIntire, Charleston, W. Va., Superintendent of Field Work of the West Virginia State Board of Agriculture.

Alva Agee, State College, Pa., Professor of Agricultural Extension, Pennsylvania State College.

William Miller, Gypsum, Ohio, Commercial Fruit Grower.

John F. Cunningham, Cleveland, Ohio, Editor of Ohio Farmer.

H. P. Miller, Westerville, Ohio, Agricultural Writer and Lecturer.

E. S. Bayard, Pittsburg, Pa., Editor of the National Stockman and Farmer.

J. Warren Smith, Columbus, Ohio, Section Director of the United States Weather Bureau.

C. B. Galbraith, Columbus, Ohio, Librarian of the Ohio State Library.

R. W. Dunlap, Kingston, Ohio, Dairy and Food Commissioner of Ohio.

T. L. Calvert, Columbus, Ohio, Secretary of the Ohio State Board of Agriculture.

Movable Agricultural School

The first movable agricultural school in Ohio was held at Paulding, Ohio, during the week of October 28, 1908. The school was under the supervision of the Department of Agricultural Extension of the Ohio Agricultural College.

"The Short Course Farmers' School" was arranged for by Mr. C. H. Allen, President of the Paulding National Bank, and was in the charge of Prof. Shields.

The work is new in Ohio, although it has been tried in some western states and West Virginia. The members of the school each pay two dollars to de-

fray expenses. Those present from the University who gave instruction were:

Live Stock, Prof. Marshal; Corn Judging, Prof. Shoesmith; Soil Fertility, Prof. McCall. Prof. Carmichael and Prof. Williams of the Experiment Station also assisted in the instructional work.

Eighty-five farmers were enrolled in the school and they became enthusiastic in their work in order that they might obtain every possible item of knowledge in the short time allotted.

It seems sure that such schools will be called for in the future from other sections of the state.



MR. C. H. ALLEN

Who arranged for the first movable
Agricultural School in Ohio.

A New Milking Machine.

According to the O. A. C. Farmer, "A new milking machine has just been completed and is in successful operation at Dayton, Ohio. It is an electric motor which fastens to the rump of the cow, the electricity being generated by a small dynamo attached to her tail. She switches her tail, the dynamo starts and by means of a bevel gear and a block and tackle, the milk is extracted, strained, and the pail and strainer is hung up to dry. A small phonograph accompanies the outfit and yells 'so' every time the cow moves. If she lifts her foot to kick, a small dingus slides over a what-not and the phonograph says 'd—n it.' If she continues to kick, a hinged arm grabs up a milk stool and caresses her back with it until a patch of shoe leather is loosened therefrom about the size of a dustpan."

Why Don't You Do It Now.

Sometime you mean to mend your ways.

Why don't you do it now?

You hope to win the whole world's praise—

Why don't you do it now?

You've always read in prose or rhyme
"The present is the golden time."

If you are ever going to climb,

Why don't you do it now?

In short, no matter what you've planned,

Why don't you do it now?

If you have work right at your hand,

Why don't you do it now?

Successful men are never late;

You'll fail if you procrastinate,

If you have vowed to conquer fate,

Why don't you do it now?

—Unidentified.

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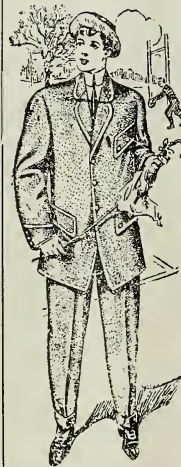
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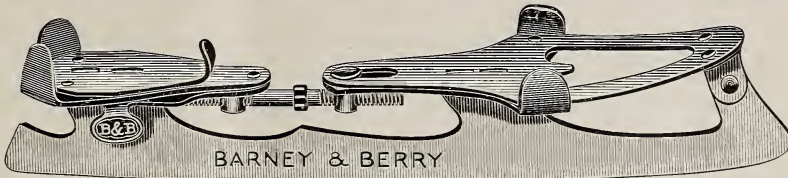
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A NEW IMPORTATION arrived August 12th. It includes the LEADING PRIZE WINNERS at the great French Shows of 1908 and the FIRST SELECTION from the greatest breeding establishments in France.

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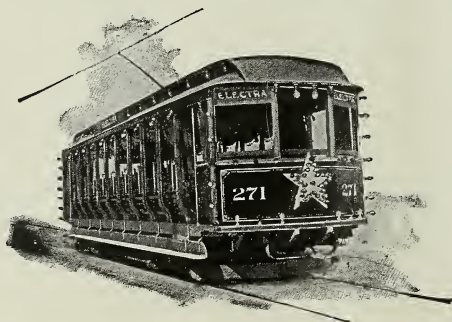
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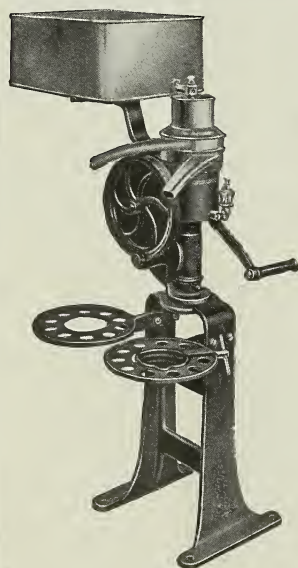
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